Fermilab

November 15, 2000

John Womersley
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MS 357

Dear John and Harry,

Thank you for Regina Demina's presentation on D0's initial plans for Run IIb at the recent meeting of the Physics Advisory Committee (PAC). The PAC had the following comments with regard to both CDF and D0:

Run II is the highest priority of the Laboratory, and the Run IIb detector upgrades are essential to exploiting the increases in luminosity associated with various planned accelerator improvements. The detector upgrades focus primarily on maintaining and possibly enhancing the capabilities of the silicon vertex detectors, whose performance will gradually degrade over time due to the effects of radiation damage. These detectors are critical to the Higgs searches and other physics goals, and it is crucial that existing capabilities be at least maintained for the duration of the run.

The CDF and D0 collaborations have made estimates of the times at which the components of the silicon detectors will significantly degrade. Increased noise and depletion voltage are two key problems, but it is very difficult to predict, even within a factor of two, when the detectors will become inoperable.

The best radiation damage estimates suggest that D0 L1 silicon will fail sometime in 2005, after accumulating ~5 fb^{-1}. Because the CDF detector has an inner L00 with greater radiation resistance, it can survive the loss of L0 and run until L00 fails sometime in 2006 after accumulating 7-12 fb^{-1}.

The Laboratory has discussed shutdowns around 2004 for the Run IIb accelerator upgrades. The detector upgrades should be coordinated with the schedule for a major accelerator shutdown.

A critical long lead-time item needed by both experiments is the readout IC. The Committee was encouraged by the possibility presented of a common solution converting the existing D0 SVX2 and CDF SVX3 designs into 0.25 μm CMOS technology - the "SVX4" chip.

- *The Committee urges the collaborations to proceed as rapidly as possible in evaluating the various possibilities, including the SVX4, for a replacement IC for the Run IIb silicon upgrades.*

- *The Committee recommends that the Laboratory provide the resources required to allow the SVX4 R&D to proceed in a timely manner.*

The Committee heard reports from CDF and D0 describing the options they have considered, which range from partial replacement of the inner layers only to complete replacement with new designs. Rough preliminary M&S cost estimates for the full replacement options were presented: $4.4M from D0 (including a new inner layer), and $4.9M from CDF. These estimates are to be compared to the guidelines suggested by the Laboratory Director of $2.5M/detector. Significant requests for FY01 R&D were also presented.

The possibility of using pixels in the innermost layer is an intriguing option mentioned by both collaborations. The Committee urges them to work closely with the Fermilab pixel group, building on the success of this R&D program.

The Committee further encourages collaboration between CDF and D0 on other common problems, such as R&D for radiation hard single-sided silicon sensors.

In summary, the Committee reiterates that these upgrade efforts are critical to the success of Run II and its exciting physics objectives. The Committee strongly encourages the collaborations to work with the Laboratory to develop effective and realistic strategies for meeting these needs, and to develop an FY01 R&D plan.

In response to the PAC's comments, the Laboratory would like to hear a progress report on defining the Run IIb silicon upgrades this coming February. In addition, we would like a quantitative discussion of the improvement in Higgs sensitivity that would be expected with a full silicon replacement.

For the April 20-22, 2001 PAC meeting, we will ask you for a status report on the silicon upgrade and a full description of other (non-silicon) upgrades that you expect to be necessary for Run IIb.

We were all pleased with the progress of D0 after hearing Harry's presentation on the status of preparations for Run IIa. The PAC had the following comments:

D0 reported much progress in fabrication of their silicon tracker and installation of other subsystems. They anticipate having a detector that is mechanically complete, with no "descoping," on March 1, 2001. They will require an estimated six weeks of integrated access time after March 1 to finish hooking up and commissioning electronics.

We in the Directorate will continue to work together with you to maximize the physics results from Runs IIa and IIb.

Sincerely,

Michael Witherell

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